[Πληκτρολογήστε το απόσπασμα του εγγράφου εδώ. Το απόσπασμα είναι συνήθως μια σύντομη σύνοψη των περιεχομένων του εγγράφου. Πληκτρολογήστε το απόσπασμα του εγγράφου εδώ. Το απόσπασμα είναι συνήθως μια σύντομη σύνοψη των περιεχομένων του εγγράφου.]

**[Πληκτρολογήστε το όνομα της εταιρείας]**

**[Πληκτρολογήστε τη διεύθυνση της εταιρείας]**

**[Πληκτρολογήστε τον αριθμό τηλεφώνου]**

**[Πληκτρολογήστε τον αριθμό φαξ]**

Τηνιακού Ειρήνη-Μαρία

**2018**

**Ecology**

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# 

# Ecology

Ecology (from Greek: οἶκος, "house", or "environment"; -λογία, "study of")[A] is the branch of biology[1] which studies the interactions among organisms and their environment. Objects of study include interactions of organisms with each other and with abiotic components of their environment. Topics of interest include the biodiversity, distribution, biomass, and populations of organisms, as well as cooperation and competition within and between species. Ecosystems are dynamically interacting systems of organisms, the communities they make up, and the non-living components of their environment. Ecosystem processes, such as primary production, pedogenesis, nutrient cycling, and niche construction, regulate the flux of energy and matter through an environment. These processes are sustained by organisms with specific life history traits. Biodiversity means the varieties of species, genes, and ecosystems, enhances certain ecosystem services.

## Urban ecology

Urban ecology is the scientific study of the relation of living organisms with each other and their surroundings in the context of an urban environment. The urban environment refers to environments dominated by high-density residential and commercial buildings, paved surfaces, and other urban-related factors that create a unique landscape dissimilar to most previously studied environments in the field of ecology.

Urban ecology is a recent field of study compared to ecology as a whole. The methods and studies of urban ecology are similar to and comprise a subset of ecology. The study of urban ecology carries increasing importance because more than 50% of the world's population today lives in urban areas. At the same time, it is estimated that within the next forty years, two-thirds of the world's population will be living in expanding urban centers.The ecological processes in the urban environment are comparable to those outside the urban context. However, the types of urban habitats and the species that inhabit them are poorly documented. Often, explanations for phenomena examined in the urban setting as well as predicting changes because of urbanization are the center for scientific research.

### History

Ecology has historically focused on "pristine" natural environments, but by the 1970s many ecologists began to turn their interest towards ecological interactions taking place in, and caused by urban environments. Jean-Marie Pelt's 1977 book The Re-Naturalized Human,[4] Brian Davis' 1978 publication Urbanization and the diversity of insects,[5] and Sukopp et al.'s 1979 article "The soil, flora and vegetation of Berlin's wastelands"[6] are some of the first publications to recognize the importance of urban ecology as a separate and distinct form of ecology the same way one might see landscape ecology as different from population ecology. Forman and Godron's 1986 book Landscape Ecology[7] first distinguished urban settings and landscapes from other landscapes by dividing all landscapes into five broad types. These types were divided by the intensity of human influence ranging from pristine natural environments to urban centers.

Urban ecology is recognized as a diverse and complex concept which differs in application between North America and Europe. The European concept of urban ecology examines the biota of urban areas, while the North American concept has traditionally examined the social sciences of the urban landscape,[8] as well as the ecosystem fluxes and processes.[9]

### Methods

Since urban ecology is a subfield of ecology, many of the techniques are similar to that of ecology. Ecological study techniques have been developed over centuries, but many of the techniques use for urban ecology are more recently developed. Methods used for studying urban ecology involve chemical and biochemical techniques, temperature recording, heat mapping remote sensing, and long-term ecological research sites.

#### Chemical and biochemical techniques

Chemical techniques may be used to determine pollutant concentrations and their effects. Tests can be as simple as dipping a manufactured test strip, as in the case of pH testing, or be more complex, as in the case of examining the spatial and temporal variation of heavy metal contamination due to industrial runoff.[10] In that particular study, livers of birds from many regions of the North Sea were ground up and mercury was extracted. Additionally, mercury bound in feathers was extracted from both live birds and from museum specimens to test for mercury levels across many decades. Through these two different measurements, researchers were able to make a complex picture of the spread of mercury due to industrial runoff both spatially and temporally.

Other chemical techniques include tests for nitrates, phosphates, sulfates, etc. which are commonly associated with urban pollutants such as fertilizer and industrial byproducts. These biochemical fluxes are studied in the atmosphere (e.g. greenhouse gasses), aquatic ecosystems and soil vegetation.[11] Broad reaching effects of these biochemical fluxes can be seen in various aspects of both the urban and surrounding rural ecosystems.

#### Temperature data and heat mapping

Temperature data can be used for various kinds of studies. An important aspect of temperature data is the ability to correlate temperature with various factors that may be affecting or occurring in the environment. Oftentimes, temperature data is collected long-term by the Office of Oceanic and Atmospheric Research (OAR), and made available to the scientific community through the National Oceanic and Atmospheric Administration (NOAA).[12] Data can be overlaid with maps of terrain, urban features, and other spatial areas to create heat maps. These heat maps can be used to view trends and distribution over time and space.[12][13]

#### Remote sensing

Remote sensing is the technique in which data is collected from distant locations through the use of satellite imaging, radar, and aerial photographs. In urban ecology, remote sensing is used to collect data about terrain, weather patterns, light, and vegetation. One application of remote sensing for urban ecology is to detect the productivity of an area by measuring the photosynthetic wavelengths of emitted light.[14] Satellite images can also be used to detect differences in temperature and landscape diversity to detect the effects of urbanization.[13]

#### LTERs and long-term data sets

Long-term ecological research (LTER) sites are research sites funded by the government that have collected reliable long-term data over an extended period of time in order to identify long-term climatic or ecological trends. These sites provide long-term temporal and spatial data such as average temperature, rainfall and other ecological processes. The main purpose of LTERs for urban ecologists is the collection of vast amounts of data over long periods of time. These long-term data sets can then be analyzed to find trends relating to the effects of the urban environment on various ecological processes, such as species diversity and abundance over time.[14] Another example is the examination of temperature trends that are accompanied with the growth of urban centers.[15]

### Urban effects on the environment

Humans are the driving force behind urban ecology and influence the environment in a variety of ways, such as modifying land surfaces and waterways, introducing foreign species, and altering biogeochemical cycles. Some of these effects are more apparent, such as the reversal of the Chicago River to accommodate the growing pollution levels and trade on the river.[16] Other effects can be more gradual such as the change in global climate due to urbanization.

#### Modification of land and waterways

Humans place high demand on land not only to build urban centers, but also to build surrounding suburban areas for housing. Land is also allocated for agriculture to sustain the growing population of the city. Expanding cities and suburban areas necessitate corresponding deforestation to meet the land-use and resource requirements of urbanization. Key examples of this are deforestation in the United States and Brazil.[18]

Along with manipulation of land to suit human needs, natural water resources such as rivers and streams are also modified in urban establishments. Modification can come in the form of dams, artificial canals, and even the reversal of rivers. Reversing the flow of the Chicago River is a major example of urban environmental modification.[16] Urban areas in natural desert settings often bring in water from far areas to maintain the human population and will likely have effects on the local desert climate.[14] Modification of aquatic systems in urban areas also results in decreased stream diversity and increased pollution.[19]

#### Trade, shipping, and spread of invasive species

Both local shipping and long-distance trade are required to meet the resource demands important in maintaining urban areas. Carbon dioxide emissions from the transport of goods also contribute to accumulating greenhouse gases and nutrient deposits in the soil and air of urban environments.[11] In addition, shipping facilitates the unintentional spread of living organisms, and introduces them to environments that they would not naturally inhabit. Introduced or alien species are populations of organisms living in a range in which they did not naturally evolve due to intentional or inadvertent human activity. Increased transportation between urban centers furthers the incidental movement of animal and plant species. Alien species often have no natural predators and pose a substantial threat to the dynamics of existing ecological populations in the new environment where they are introduced. Such invasive species are numerous and include house sparrows, ring-necked pheasants, European starlings, brown rats, Asian carp, American bullfrogs, emerald ash borer, kudzu vines, and zebra mussels among numerous others, most notably domesticated animals.[20][21] In Australia, it has been found that removing Lantana (L. camara, an alien species) from urban greenspaces can surprisingly have negative impacts on bird diversity locally, as it provides refugia for species like the superb fairy (Malurus cyaneus) and silvereye (Zosterops lateralis), in the absence of native plant equivalents . Although, there seems to be a density threshold in which too much Lantana (thus homogeneity in vegetation cover) can lead to a decrease in bird species richness or abundance .

#### Human effects on biogeochemical pathways

Urbanization results in a large demand for chemical use by industry, construction, agriculture, and energy providing services. Such demands have a substantial impact on biogeochemical cycles, resulting in phenomena such as acid rain, eutrophication, and global warming.[11] Furthermore, natural biogeochemical cycles in the urban environment can be impeded due to impermeable surfaces that prevent nutrients from returning to the soil, water, and atmosphere.[22]

Demand for fertilizers to meet agricultural needs exerted by expanding urban centers can alter chemical composition of soil. Such effects often result in abnormally high concentrations of compounds including sulfur, phosphorus, nitrogen, and heavy metals. In addition, nitrogen and phosphorus used in fertilizers have caused severe problems in the form of agricultural runoff, which alters the concentration of these compounds in local rivers and streams, often resulting in adverse effects on native species.[23] A well-known effect of agricultural runoff is the phenomenon of eutrophication. When the fertilizer chemicals from agricultural runoff reach the ocean, an algal bloom results, then rapidly dies off.[23] The dead algae biomass is decomposed by bacteria that also consume large quantities of oxygen, which they obtain from the water, creating a "dead zone" without oxygen for fish or other organisms. A classic example is the dead zone in the Gulf of Mexico due to agricultural runoff into the Mississippi River.

Just as pollutants and alterations in the biogeochemical cycle alter river and ocean ecosystems, they exert likewise effects in the air. Smog stems from the accumulation of chemicals and pollution and often manifests in urban settings, which has a great impact on local plants and animals. Because urban centers are often considered point sources for pollution, unsurprisingly local plants have adapted to withstand such conditions.[11]

## Ecosystem ecology

Ecosystem ecology is the integrated study of living (biotic) and non-living (abiotic) components of ecosystems and their interactions within an ecosystem framework. This science examines how ecosystems work and relates this to their components such as chemicals, bedrock, soil, plants, and animals.

Ecosystem ecology examines physical and biological structures and examines how these ecosystem characteristics interact with each other. Ultimately, this helps us understand how to maintain high quality water and economically viable commodity production. A major focus of ecosystem ecology is on functional processes, ecological mechanisms that maintain the structure and services produced by ecosystems. These include primary productivity (production of biomass), decomposition, and trophic interactions.

Studies of ecosystem function have greatly improved human understanding of sustainable production of forage, fiber, fuel, and provision of water. Functional processes are mediated by regional-to-local level climate, disturbance, and management. Thus ecosystem ecology provides a powerful framework for identifying ecological mechanisms that interact with global environmental problems, especially global warming and degradation of surface water.

This example demonstrates several important aspects of ecosystems:

* Ecosystem boundaries are often nebulous and may fluctuate in time
* Organisms within ecosystems are dependent on ecosystem level biological and physical processes
* Adjacent ecosystems closely interact and often are interdependent for maintenance of community structure and functional processes that maintain productivity and biodiversity

These characteristics also introduce practical problems into natural resource management. Who will manage which ecosystem? Will timber cutting in the forest degrade recreational fishing in the stream? These questions are difficult for land managers to address while the boundary between ecosystems remains unclear; even though decisions in one ecosystem will affect the other. We need better understanding of the interactions and interdependencies of these ecosystems and the processes that maintain them before we can begin to address these questions.

Ecosystem ecology is an inherently interdisciplinary field of study. An individual ecosystem is composed of populations of organisms, interacting within communities, and contributing to the cycling of nutrients and the flow of energy. The ecosystem is the principal unit of study in ecosystem ecology.

Population, community, and physiological ecology provide many of the underlying biological mechanisms influencing ecosystems and the processes they maintain. Flowing of energy and cycling of matter at the ecosystem level are often examined in ecosystem ecology, but, as a whole, this science is defined more by subject matter than by scale. Ecosystem ecology approaches organisms and abiotic pools of energy and nutrients as an integrated system which distinguishes it from associated sciences such as biogeochemistry.[1]

Biogeochemistry and hydrology focus on several fundamental ecosystem processes such as biologically mediated chemical cycling of nutrients and physical-biological cycling of water. Ecosystem ecology forms the mechanistic basis for regional or global processes encompassed by landscape-to-regional hydrology, global biogeochemistry, and earth system science.[1]

### History

Ecosystem ecology is philosophically and historically rooted in terrestrial ecology. The ecosystem concept has evolved rapidly during the last 100 years with important ideas developed by Frederic Clements, a botanist who argued for specific definitions of ecosystems and that physiological processes were responsible for their development and persistence.[2] Although most of Clements ecosystem definitions have been greatly revised, initially by Henry Gleason and Arthur Tansley, and later by contemporary ecologists, the idea that physiological processes are fundamental to ecosystem structure and function remains central to ecology.

Later work by Eugene Odum and Howard T. Odum quantified flows of energy and matter at the ecosystem level, thus documenting the general ideas proposed by Clements and his contemporary Charles Elton. See Figure 3.

In this model, energy flows through the whole system were dependent on biotic and abiotic interactions of each individual component (species, inorganic pools of nutrients, etc.). Later work demonstrated that these interactions and flows applied to nutrient cycles, changed over the course of succession, and held powerful controls over ecosystem productivity.[4][5] Transfers of energy and nutrients are innate to ecological systems regardless of whether they are aquatic or terrestrial. Thus, ecosystem ecology has emerged from important biological studies of plants, animals, terrestrial, aquatic, and marine ecosystems.

### Ecosystem services

Ecosystem services are ecologically mediated functional processes essential to sustaining healthy human societies.[6] Water provision and filtration, production of biomass in forestry, agriculture, and fisheries, and removal of greenhouse gases such as carbon dioxide (CO2) from the atmosphere are examples of ecosystem services essential to public health and economic opportunity. Nutrient cycling is a process fundamental to agricultural and forest production.

However, like most ecosystem processes, nutrient cycling is not an ecosystem characteristic which can be “dialed” to the most desirable level. Maximizing production in degraded systems is an overly simplistic solution to the complex problems of hunger and economic security. For instance, intensive fertilizer use in the midwestern United States has resulted in degraded fisheries in the Gulf of Mexico.[7] Regrettably, a “Green Revolution” of intensive chemical fertilization has been recommended for agriculture in developed and developing countries.[8][9] These strategies risk alteration of ecosystem processes that may be difficult to restore, especially when applied at broad scales without adequate assessment of impacts. Ecosystem processes may take many years to recover from significant disturbance.[5]

For instance, large-scale forest clearance in the northeastern United States during the 18th and 19th centuries has altered soil texture, dominant vegetation, and nutrient cycling in ways that impact forest productivity in the present day.[10][11] An appreciation of the importance of ecosystem function in maintenance of productivity, whether in agriculture or forestry, is needed in conjunction with plans for restoration of essential processes. Improved knowledge of ecosystem function will help to achieve long-term sustainability and stability in the poorest parts of the world.

### Operation

Biomass productivity is one of the most apparent and economically important ecosystem functions. Biomass accumulation begins at the cellular level via photosynthesis. Photosynthesis requires water and consequently global patterns of annual biomass production are correlated with annual precipitation.[12] Amounts of productivity are also dependent on the overall capacity of plants to capture sunlight which is directly correlated with plant leaf area and N content.

Net primary productivity (NPP) is the primary measure of biomass accumulation within an ecosystem. Net primary productivity can be calculated by a simple formula where the total amount of productivity is adjusted for total productivity losses through maintenance of biological processes:

NPP = GPP – Rproducer

Where GPP is gross primary productivity and Rproducer is photosynthate (Carbon) lost via cellular respiration.

NPP is difficult to measure but a new technique known as eddy co-variance has shed light on how natural ecosystems influence the atmosphere. Figure 4 shows seasonal and annual changes in CO2 concentration measured at Mauna Loa, Hawaii from 1987 to 1990. CO2 concentration steadily increased, but within-year variation has been greater than the annual increase since measurements began in 1957.

These variations were thought to be due to seasonal uptake of CO2 during summer months. A newly developed technique for assessing ecosystem NPP has confirmed seasonal variation are driven by seasonal changes in CO2 uptake by vegetation.[15][14] This has led many scientists and policy makers to speculate that ecosystems can be managed to ameliorate problems with global warming. This type of management may include reforesting or altering forest harvest schedules for many parts of the world.

## Organizational ecology

Organizational ecology (also organizational demography and the population ecology of organizations) is a theoretical and empirical approach in the social sciences that is considered a sub-field of organizational studies. Organizational ecology utilizes insights from biology, economics,[1] and sociology, and employs statistical analysis to try to understand the conditions under which organizations emerge, grow, and die.

The ecology of organizations is divided into three levels, the community, the population, and the organization. The community level is the functionally integrated system of interacting populations. The population level is the set of organizations engaged in similar activities. The organization level focuses on the individual organizations (some research further divides organizations into individual member and sub-unit levels[2]).

What is generally referred to as organizational ecology in research is more accurately population ecology, focusing on the second level.[3]

### Development

Wharton School researcher William Evan called the population level the organization-set, and focused on the interrelations of individual organizations within the population as early as 1966.[4] However, prior to the mid-1970s, the majority of organizational studies research focused on adaptive change in organizations (See also adaptive management and adaptive performance). The ecological approach moved focus to the environmental selection processes that affect organizations.[3]

In 1976, Eric Trist defined population ecology as "the study of the organizational field created by a number of organizations whose interrelations compose a system at the level of the whole field". He also advocated for organizational studies research to focus on populations and individual organizations as part of open rather than closed systems that have both bureaucratic (internal) regulation and ecological (community environment) regulation (see also Open and closed systems in social science).[5]

The first explicit formulation of a theory of population ecology, by Michael T. Hannan and the late John H. Freeman in their 1977 American Journal of Sociology piece "The population ecology of organizations" and later refined in their 1989 book Organizational Ecology, examines the environment in which organizations compete and how a process like natural selection occurs. This theory looks at the death of organizations (firm mortality), the birth of new organizations (organizational founding), as well as organizational growth and change.

Organizational ecology has over the years become one of the central fields in organizational studies, and is known for its empirical, quantitative character. Ecological studies usually have a large-scale, longitudinal focus (datasets often span several decades, sometimes even centuries). The books The Demography of Corporations and Industries by Glenn Carroll and Michael Hannan (2000) and Logics of Organization Theory: Audiences, Codes, and Ecologies by Michael Hannan, Laszlo Polos, and Glenn Carroll (2007), provide the most comprehensive overview of the various theories and methods in organizational ecology.

### Evolutionary approaches to organizations

Organizational ecology can be usefully compared with evolutionary theories in economics (e.g. Nelson & Winter, 1982).[1] Hannan and Freeman also note the influences of biological ecology and economic evolution on their population ecology model (specifically Elton, 1927; Durkheim, 1947; Hawley, 1950; and Hutchison, 1959).[2] Main similarities between these strands of literature are: (1) the emphasis on organizational routines and the limits to organizational adaptability, (2) the population or system level of analysis and (3) the importance of environmental selection. Organizational ecology's perspective is more Darwinistic (see Hannan & Freeman, 1989, pp 20–22), while Nelson & Winter (1982, p. 11) provide a more Lamarckian perspective. Another important difference concerns the question: What is selected by the environment-- 'organizational forms', as in organizational ecology, or 'routines' as in the evolutionary economics literature? Authors like Joel Baum and Arjen van Witteloostuijn have argued for the potential of cross-fertilization between these two research strands.

A social networks perspective on the evolution of large scale interfirm organizational networks was presented by Braha et al.[8] who propose micro-dynamic models that reproduce actual large-scale interfirm perceived competition networks. Several evolutionary mechanisms of organizational networks are identified: spatial locations of firms are positively correlated with the population density; interfirm competition is governed by cumulative advantage rules and geographic distance; and competition network formation and firm size dynamics are closely intertwined.

Complex Table (less accessible)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| LESSON | TOPIC | ASSINGMENT | Points | DUE |
| 1 | What is Distance Learning? | Wiki #1 | 10 | March 10 |
| Presentation | 20 |  |
| 2 | History & Theories | Brief Paper | 20 | March 24 |
| Spring Break | | | | |
| 3 | Distance Learners | Discussion #1 | 10 | April 7 |
| Group Project | 50 | April 14 |
| 4 | Media Selection | Blog #1 | 10 | April 21 |

**Class Schedule**

## Community (ecology)

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*"*Ecological community" redirects here. For human community organized around economic and ecological sustainability, see ecovillag

In ecology, a community is a group or [association](https://en.wikipedia.org/wiki/Association_(ecology)) of [populations](https://en.wikipedia.org/wiki/Population) of two or more different [species](https://en.wikipedia.org/wiki/Species) occupying the same geographical area and in a particular time, also known as a [biocoenosis](https://en.wikipedia.org/wiki/Biocoenosis" \o "Biocoenosis) The term community has a variety of uses. In its simplest form it refers to groups of organisms in a specific place or time, for example, "the fish community of Lake Ontario before industrialization".

Community ecology or synecology is the study of the interactions between species in communities on many spatial and temporal scales, including the distribution, structure, abundance, [demography](https://en.wikipedia.org/wiki/Demography), and [interactions](https://en.wikipedia.org/wiki/Biological_interaction) between coexisting populations.[[1]](https://en.wikipedia.org/wiki/Community_(ecology)#cite_note-Sahney_Benton_2008-1) The primary focus of community ecology is on the interactions between populations as determined by specific [genotypic](https://en.wikipedia.org/wiki/Genotypic) and [phenotypic](https://en.wikipedia.org/wiki/Phenotypic) characteristics. Community ecology has its origin in European [plant sociology](https://en.wikipedia.org/wiki/Phytosociology). Modern community ecology examines patterns such as variation in [species richness](https://en.wikipedia.org/wiki/Species_richness), equitability, [productivity](https://en.wikipedia.org/wiki/Productivity_(ecology)) and [food web](https://en.wikipedia.org/wiki/Food_web) structure (see [community structure](https://en.wikipedia.org/wiki/Community_structure)); it also examines processes such as predator–prey [population dynamics](https://en.wikipedia.org/wiki/Population_dynamics), [succession](https://en.wikipedia.org/wiki/Ecological_succession), and [community assembly](https://en.wikipedia.org/w/index.php?title=Community_assembly&action=edit&redlink=1).

On a deeper level the meaning and value of the community concept in ecology is up for debate. Communities have traditionally been understood on a fine scale in terms of local processes constructing (or destructing) an assemblage of species, such as the way climate change is likely to affect the make-up of grass communities.[[2]](https://en.wikipedia.org/wiki/Community_(ecology)#cite_note-2) Recently this local community focus has been criticised. [Robert Ricklefs](https://en.wikipedia.org/wiki/Robert_Ricklefs) has argued that it is more useful to think of communities on a regional scale, drawing on evolutionary [taxonomy](https://en.wikipedia.org/wiki/Taxonomy_(biology)) and [biogeography](https://en.wikipedia.org/wiki/Biogeography),[[1]](https://en.wikipedia.org/wiki/Community_(ecology)#cite_note-Sahney_Benton_2008-1) where some species or [clades](https://en.wikipedia.org/wiki/Clade" \o "Clade) evolve and others go extinct.[[3]](https://en.wikipedia.org/wiki/Community_(ecology)#cite_note-3)

### Theories:

* Holistic theory

Clements developed a holistic (or organismic) concept of community, as it was a superorganism or discrete unit, with sharp boundaries.

* Individualistic theory

Gleason developed the individualistic (also known as open or continuum) concept of community, with the abundance of a population of a species changing gradually along complex environmental gradients, but individually, not equally to other populations. In that view, it is possible that individualistic distribution of species gives rise to discrete communities as well as to continuum. Niches would not overlap.[4][5]

* Neutral theory

In the neutral theory view of the community (or metacommunity), popularized by Hubbell, species are functionally equivalent, and the abundance of a population of a species changes by stochastic demographic processes (i.e., random births and deaths).[6] Each population would have the same adaptive value (competitive and dispersal abilities), and local and regional composition would represent a balance between speciation or dispersal (which increase diversity), and random extinctions (which decrease diversity).[7]

### Interspecific interactions

Species interact in various ways: competition, predation, parasitism, mutualism, commensalism, etc. The organization of a biological community with respect to ecological interactions is referred to as community structure.

## Natural environment

The natural environment encompasses all living and non-living things occurring naturally, meaning in this case not artificial. The term is most often applied to the Earth or some parts of Earth. This environment encompasses the interaction of all living species, climate, weather, and natural resources that affect human survival and economic activity. [1] The concept of the natural environment can be distinguished as components:

* Complete ecological units that function as natural systems without massive civilized human intervention, including all vegetation, microorganisms, soil, rocks, atmosphere, and natural phenomena that occur within their boundaries and their nature.
* Universal natural resources and physical phenomena that lack clear-cut boundaries, such as air, water, and climate, as well as energy, radiation, electric charge, and magnetism, not originating from civilized human actions

In contrast to the natural environment is the built environment. In such areas where man has fundamentally transformed landscapes such as urban settings and agricultural land conversion, the natural environment is greatly modified into a simplified human environment. Even acts which seem less extreme, such as building a mud hut or a photovoltaic system in the desert, modify the natural environment into an artificial one. Though many animals build things to provide a better environment for themselves, they are not human, hence beaver dams and the works of Mound-building termites are thought of as natural.

People seldom find absolutely natural environments on Earth, and naturalness usually varies in a continuum, from 100% natural in one extreme to 0% natural in the other. More precisely, we can consider the different aspects or components of an environment, and see that their degree of naturalness is not uniform.[2] If, for instance, in an agricultural field, the mineralogic composition and the structure of its soil are similar to those of an undisturbed forest soil, but the structure is quite different.

Natural environment is often used as a synonym for habitat. For instance, when we say that the natural environment of giraffes is the savanna.

### Composition

Earth science generally recognizes 4 spheres, the lithosphere, the hydrosphere, the atmosphere, and the biosphere[3] as correspondent to rocks, water, air, and life respectively. Some scientists include, as part of the spheres of the Earth, the cryosphere (corresponding to ice) as a distinct portion of the hydrosphere, as well as the pedosphere (corresponding to soil) as an active and intermixed sphere. Earth science (also known as geoscience, the geosciences or the Earth Sciences), is an all-embracing term for the sciences related to the planet Earth.[4] There are four major disciplines in earth sciences, namely geography, geology, geophysics and geodesy. These major disciplines use physics, chemistry, biology, chronology and mathematics to build a qualitative and quantitative understanding of the principal areas or spheres of Earth.

### Geological Activity

The Earth's [crust](https://en.wikipedia.org/wiki/Crust_(geology)), or [lithosphere](https://en.wikipedia.org/wiki/Lithosphere), is the outermost solid surface of the planet and is chemically and mechanically different from underlying [mantle](https://en.wikipedia.org/wiki/Mantle_(geology)). It has been generated greatly by [igneous](https://en.wikipedia.org/wiki/Igneous) processes in which [magma](https://en.wikipedia.org/wiki/Magma) cools and solidifies to form solid rock. Beneath the lithosphere lies the mantle which is heated by the [decay](https://en.wikipedia.org/wiki/Radioactive_decay) of [radioactive elements](https://en.wikipedia.org/wiki/Radioactive_element). The mantle though solid is in a state of [rheic](https://en.wikipedia.org/wiki/Rheid" \o "Rheid) [convection](https://en.wikipedia.org/wiki/Convection). This convection process causes the lithospheric plates to move, albeit slowly. The resulting process is known as [plate tectonics](https://en.wikipedia.org/wiki/Plate_tectonics). [Volcanoes](https://en.wikipedia.org/wiki/Volcanoes) result primarily from the melting of [subducted](https://en.wikipedia.org/wiki/Subduction" \o "Subduction) crust material or of rising mantle at [mid-ocean ridges](https://en.wikipedia.org/wiki/Mid-ocean_ridge) and [mantle plumes](https://en.wikipedia.org/wiki/Mantle_plume).

## «Η οικογένειά μου»